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DEVELOPMENT OF SCIENCES IN THE SIBERIAN BRANCH
OF THE ACADEMY OF SCIENCES USSR

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DEVELOPMENT OF SCIENCES IN THE SIBERIAN BRANCH
OF THE ACADEMY OF SCIENCES USSR

[Following is a translation of an article written by the Editorial Board of Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSSR, (News of the Siberian Branch of the Academy of Sciences USSR), No 1, Novosibirsk, Jan 1960, pages 3-16.]

The 21st Congress of the Communist Party of the Soviet Union outlined the great program of development of a communist society in our country, designating concrete means for creating the material-technical base of communism. During the seven-year period 1959-1965 the eastern regions of the country, for the development of which approximately 40 percent of all new capital investments is planned, will be of special importance, as it is the aim to distribute productive strength soundly. These sums are to be used toward establishing enterprises, especially for the extraction of petroleum and gas, the generation of electrical energy and toward increasing the output of new chemical products. It is precisely here that invested capital can have the greatest economical effect, due to the exceptionally successful combination of raw material resources and great energy reserves (coal, water power, gas). At the end of the seven-year period Siberia should become the most important base in the USSR for extraction of coal, generation of electrical energy, output of light metals (aluminum, magnesium, titanium) and alloys, and also of rare metals of high purity, output of synthetic polymeric materials (plastics, synthetic rubber, synthetic fiber).

The wide development of Agriculture and Forestry was projected on a level with the development of industry in Siberia and the Far East. More than 75 percent of all the forest wealth in the USSR is concentrated here, and there

are great expanses of waste land and virgin soil.

Advanced Soviet science is called upon to play an enormous role in realizing the seven-year plan. According to the report of N. S. Khrushchev "Concerning the control figures of the development of the national economy of the USSR for the years from 1959 to 1965" the resolution of the 21st Congress of the Communist Party of the Soviet Union states: "While noting the great achievements of Soviet science in all fields of knowledge, especially in the fields of nuclear physics and atomic energy, jet-powered aviation and rocket technology, the convention considers it essential to achieve, during the seven year plan, the still faster development of all branches of science, and the realization of important theoretical research, assuring further scientific and technical progress. The aim is to foresee a wide program of scientific research work, concentrating scientific forces and means in the most important directions of practical and theoretical significance. We must constantly strengthen the link between scientific institutes and practical application, introduce the newest scientific and technological achievements into the national economy more rapidly and on a wider scale, carry out experimental and structural work more boldly."

The Siberian Branch of the Academy of Sciences USSR, organized in May 1957 by a resolution of the Council of Ministers USSR, is called upon to play a leading part in the fulfilling of the grandiose tasks of a quicker awakening of productive forces in Siberia and the Far East. At the present time the Siberian Branch of the Academy of Sciences USSR is the most important scientific center in the eastern part of the country: it combines about twenty scientific-research institutes, situated in Nauchniy Gorod and in Novosibirsk itself: Institute of Mathematics with Computation Center, Institute of Hydrodynamics, Institute of Theoretical and Applied Mechanics, Institute of Nuclear Physics, Institute of Thermodynamics, Institute of Automation and Electrical Measurements, Institute of Inorganic Chemistry, Institute of Organic Chemistry, Institute of Catalysis, Institute of Chemical Kinetics and Combustion, Institute of Geology and Geophysics, Institute of Cytology and Genetics,

Institute of Experimental Biology and Medicine, Institute of Economics and Organization of Industrial Production, Institute of Radio Physics and Electronics, Institute of Mining, Institute of Transport Energy, Chemico-metallurgical Institute, Institute of Biology and Central Siberian Botanical Garden; the East Siberian Affiliate and four institutes: the East Siberian Institute of Geology, Geography, Geochemistry and Organic Chemistry in Irkutsk; the Yakutsk Affiliate; the Far East Affiliate in Vladivostok; the Institute of Physics and the Institute of Forestry and Lumber in Krasnoyarsk; and also the group scientific research institutes - in Ulan-Ude and Sakhalinskiy in the town of Novo-Aleksandrovsk.

Ten academicians and twenty seven corresponding members of the Academy of Sciences USSR, over seventy doctors of science and more than five hundred candidates of science, work in the scientific institutes of the Siberian branch.

In 1959 the scientists of Siberia and the Far East were working on the solution to 131 scientific problems. In accordance with the instructions of the 21st Congress of the Communist Party of the Soviet Union of concentrating scientific forces and means in the more important directions, the Presidium of the Siberian branch of the Academy of Sciences USSR last year separated the leading problems to be solved during the seven years between 1959 and 1965. The work of the Branch should take place in the fundamental scientific directions specified by the General Meeting of the Academy of Sciences USSR in March 1959. During the seven year period, in accordance with 23 directives, the scientists of Siberia and the Far East will work on the 64 most important problems in the field of physico-mathematical sciences, technological sciences, chemical, geologico-geographical, biological, economical, and philosophical sciences, historical and philological sciences.

In the field of physico-mathematical and technological sciences, the scientists of the Siberian branch will solve a series of principal scientific problems of important theoretical and practical significance.

Under the direction of corresponding member of the

Academy of Sciences USSR G. I. Budker the following will take place: the study of the possibility of realizing controllable thermonuclear reactions, the development of accelerators of elementary particles, research in the field of physics of ultrahigh energy particles in accelerators. Investigations on the variations of intensity of cosmic rays and the study of the interaction of high energy particles with nuclei of atoms of air are being carried out together with the Physical Institute imeni P. N. Lebedev of the Academy of Sciences USSR. The results of this work will enable us to come closer to understanding the structure of the nucleus, and by way of nuclear processes to master the problem of atomic energy far beyond present limits, and also to widen knowledge of the processes taking place in interplanetary space, on the sun and in the magnetic field of the earth and in the atmosphere.

Under the direction of academician Yu. N. Rabotnov and corresponding member of the Academy of Sciences USSR E. I. Grigolyuk the questions of stability at high temperatures and of dynamic stability will be studied. The study of the nature and causes of the disintegration of objects at high temperatures will be of special importance in connection with the stepping up of working parameters of power installations, the development of high speed aviation, together with the search for new heat resistant materials. The formulation of a complete theory of the deformation and disintegration under these conditions will permit the development of methods for computing stability at high temperatures which will be applicable to turbine structure and recommendations for the best construction of objects. The relation of stability to impacts and the reaction on structure of liquid or gas flow is the object of the study of dynamic stability. As a result fatigue in metals and plastics under complex stress conditions should be studied. Apart from this, the characteristics of the mechanical stability of steels and plastic materials at various temperatures, in particular down to -70° , will be studied in order to explain the occurrence of friability and cold brittleness in materials and components under conditions of severe cold in Siberia.

Under the direction of L. V. Kirenskiy, doctor of physico-mathematical sciences, the magnetic properties of ferro-magnets and new magnetic materials, in particular ferrites and thin ferro-magnetic layers, will be studied and new methods of radiospectroscopy and emission spectra analysis will be developed with the aim of formulating reliable and quick methods for controlling the technological process of extracting rare and non-ferrous metals.

The problems of power-engineering are being studied from several angles by the scientists at the Siberian branch. Under the direction of I. I. Novikov, corresponding member of the Academy of Sciences USSR, S. S. Kutateladze, doctor of technological sciences and P. G. Strelkov, doctor of physico-mathematical sciences the fundamental aspects of the theory of crises in the boiling borderline layer, of the theory of heat exchange in burning streams, and of the semi-empirical theory of turbulent heat transmission in molten metal heat conductors should be developed. On this base a series of specific problems will be solved in connection with heat exchange and aerodynamics in branches of the new technology using stepped up thermal streams: in the chambers of superpower steam boilers, in heat exchange installations in metallurgical and chemical industry, in the elements of turbo-machines and others. Methods and experimental apparatus will be devised to determine the thermodynamic and thermophysical properties (enthalpy, density, viscosity, thermal conductivity and others) of different heat conductors - molten metals, organic compounds and so forth -- in particular at low and high temperatures ranging from 1.5° K. to 1100°K, among these, spectroscopic investigations in different regions of the spectrum will be carried out with the aim of obtaining statistically a consequent computation of the thermodynamic functions of the products of chemical reactions of burning and synthesis. The basic methods will be developed and the first models of apparatus for measuring thermophysical properties at temperatures up to 2500°K will be built.

Academician S. A. Khristianovich, corresponding member of the Academy of Sciences A. A. Koval'skiy and doctor of technical sciences L. S. Kozachenko are directing the

work of devising high-power steam-gas turbine equipment in which burning should take place under a pressure of 60 to 80 atmospheres; the working agent will be a steam-gas mixture. It is expected that the cost of an electrical power plant with a high-power steam-gas turbine installation will be about two times smaller than the cost of a power plant with a steam turbine installation of comparable power, besides the efficiency of a steam-gas turbine installation is expected to be equal to the efficiency of better steam-turbine installations. The solution of this problem will require research into the process of burning under different conditions, in particular the process of turbulent burning, and the process of evaporation; it will also require the study of the velocity of the spreading of flames in a stream and a series of other practical questions.

The scientific bases for creating and developing a unified power system for Siberia are being worked on under the direction of V. K. Shcherbakov and K. N. Korzhavin, doctors of technical sciences, and D. I. Abramovich, doctor of geographical sciences. This problem is of special importance, because during the seven-year period the output of electric power in the eastern regions of the country will make up 45 percent of the total output in the USSR. The alternatives to the structural plan of the unified power system of Siberia and its links with the systems of the Urals, Kazakhstan, and the Far East will be established. For the specific conditions of Siberia the theory, plans and parameters of long distance transmissions from 2000 km to 3000 km will be developed taking climatic characteristics into account. Measures for controlling the hydrological and ice thermal conditions are being developed for the major reservoirs of Siberia; in particular the questions of permitting the passage of ice through the dam of the Bratskaya Hydrological Energy System are being solved. These investigations are being conducted with the close cooperation of the Power Engineering Institute of the Academy of Sciences USSR and the Siberian Councils of National Economy.

In connection with the intensive building of power plants in Siberia, it is very important to study the hydrodynamics of large and high head major water power installa-

tions and the characteristics of their work under local conditions. The specific natural conditions, the high capacities of the water power installations and the great heights of the dams in Siberian hydrostations when compared to hydrostations built in other parts of the USSR, lead to the emergence of new hydraulic phenomena: the intense aeration of the stream, forming of vacuum and in connection with the latter the occurrence of cavitation causing damage to the installation. In the case of high-head water power installations it is economically expedient to build not sluices for ship passage installations but vertical or oblique ship hoists, the hydrodynamic characteristics of which still require serious study. This work is being conducted under the direction of academician P. Ya. Konchina.

A number of institutes and affiliates of the branch, in coordination with the Department of Technical Sciences of the Academy of Sciences USSR and the GNTK / State Scientific Technical Committee? / of the Council of Ministers USSR is studying questions of the complex utilization of coals of Siberia and the Far East for power engineering, metallurgy and chemistry. The establishing of the country's third metallurgical base in Siberia, the wide development of the chemical industry and the building here of large thermal electric power stations dictate the necessity of incorporating the efforts of chemists and thermal technicians in the questions of the organization of production of blast furnace coke from gaseous coal and coal of low clinkering capacity, affording the greatest yield of benzene and other chemical substances for the needs of the synthetic industry, in the questions of the gas-power-chemical utilization of power-producing coals and brown coals (delivery of electrical power, high calorific gas and raw material for chemical production), the effective burning of coal suitable for large electric power stations and for gas and steam-gas turbines.

In the field of mathematics under the direction of academician S. L. Sobolev and academician I. N. Vekua the general theory of differential equations in partial derivatives and its practical application will be developed,

besides which it is proposed to develop considerably the general theory of boundary problems, in particular to determine possible new areas for the application of theories to present-day needs: to apply mathematical methods to hydrometeorology, the mathematical prediction of the change in river levels, and so on. Mathematicians together with corresponding member of the Academy of Sciences USSR K. B. Karandeyev, corresponding member of the Academy of Sciences USSR V. N. Avdeyev and the associations of industrial enterprises of Novosibirsk will be occupied with the development of cybernetics and mathematical logic, the devising of new types of calculating machines for geophysical, medical and other studies. It is proposed to increase considerably the working speed and reliability of mathematical machines and to decrease their bulk and power intake.

In the field of radio-electronics under the direction of doctor of Physico-Mathematical Sciences Yu. B. Rumer the methods of the generation, amplification and conversion of high-frequency electro-magnetic vibrations are being developed, theoretical and experimental studies of radiating systems and the elements of wave guidance are being conducted. As a result of these studies electronic instruments should be devised which will find applications in radio-astronomy, radio-meteorology, radio relay and wave transmission connections, in centimeter and millimeter bands. The results obtained will help to make powerful radiotelescopes, directional antennae and other various electronic instruments. Under the direction of associate member of the Academy of Sciences USSR V. N. Avdeyev work is being conducted towards increasing the resolving power of receiving-amplifying electronic instruments with the aim of decreasing the power intake and of increasing the measurable range of the currents and potentials. The problem which presents itself in particular is that of creating electronic logic elements which could replace in computers, radio technology, automation and telemechanics not only radio tubes and semiconductors, but which would eliminate the necessity for a large number of radio components.

The participation of the Siberian branch in the solving of the general academic problem of the "scientific bases

for the automation of production processes" aids in putting into practice the party's decisions concerning automation of industry. Corresponding Member of the Academy of Sciences USSR K. B. Karandeyev directs the research on the characteristics of automation processes (in the radio-technological and chemical industries) and on the development of algorithms for regulating these processes; investigations on the problems of increasing the economy, operating speed and reliability of the regulating systems and on the development and application of computers in the automation systems of production processes. For the goals of communication, telemechanics and automation in mining the application of high-frequency currents is being perfected. Improved methods of automatic control, methods and means of conversion towards information transmission will be developed with the aim of creating measuring devices of great accuracy for systems of automatic regulation and scientific research.

An association of scientists under the direction of academician M. A. Lavrent'yev is dealing with the questions of utilizing explosions in the national economy: for stripping work when organizing open pit working of useful minerals, for deepening river beds and the laying of canals, for the removal of ice masses in the region of the North Sea route and on the Siberian rivers, for underwater plunger-harvesting work and other uses. By means of solving a series of problems in the field of gravitational waves and space currents, it is proposed to show means of forecasting with tidal waves, to give recommendations concerning navigation in connection with underwater waves and currents. The most recent work is directed by academician P. Ya. Konchina and doctor of technical sciences G. S. Migirenko, together with M. A. Lavrent'yev.

The research on the process of streamlining objects at very high speeds and temperatures is being directed by academician S. A. Khristianovich. This problem is of prime importance for the flight of objects at supersonic speeds. The intensive theoretical and experimental research on the problems of magneto-hydrodynamics, the investigation of the process of thermal radiation, dissociation and ionization should assure the calculation of the fusion of

objects entering the earth's atmosphere, and should help in creating in metallurgy high temperature alloys and coatings to deposit on the fundamental material.

The study of the problems of mining mechanics and mining pressure, the devising of effective systems of working coal and ore deposits are being conducted by associations of scientists under the direction of Academician S. A. Khristianovich, corresponding members of the Academy of Sciences USSR N. A. Chinakal and T. F. Gorbachev. This work will permit the perfection of the present means and the obtaining of new means, systems and methods of mining coal and ores in the Kuzbass and western Siberia, the mechanization of the extraction of coal and low quality mining rocks, the development of the basis for the fight against dust in the pits and the ventilation of the mines of Siberia. Scientifically based methods of calculating the pressure in mines will be devised with the aim of offering new methods of working coal deposits, in particular connected with hydraulic extraction and sudden discharges. The theory of the mechanism of coal and gas discharges and the theory of the hydraulic collapse of seams will be developed. All this will enable the formulation of more effective and proven methods of mine working.

The solution of the problems of breaking down and drilling rocks, also connected with the mining industry, is being directed by academician M. A. Lavrent'yev, corresponding member of the Academy of Sciences USSR N. A. Chinakal and candidate of technical sciences B. V. Sudnishnikov. As a result of this work, it is proposed to formulate a theory of drilling machines, to develop the methods of calculation and to create new types of machines and working instruments for drilling wells in underground conditions and in open pit works. The new machines should ensure a sharp rise in productivity when compared to the present. The principles for obtaining swift water streams, the formulation of the elements of the theory of breaking down rocks during hydraulic extraction and with the use of explosives should also be developed. Together with the Institute of Mining of the Academy of Sciences USSR the Siberian branch is developing the technological schemes for extracting rare and non-ferrous metals together with iron from iron ore

deposits, of extracting valuable components from coal and ash of Kuzbass, and it is working on the formulation of methods and plans of concentrating the residue from thin parts of different deposits.

In the field of chemical sciences the scientists of Siberia and the Far East will concentrate on solving the problems set by the May 1958 Plenum of the Central Committee of the Communist Party of the Soviet Union and by the 21st party Congress.

Research on the chemistry of high molecular compounds is being carried out under the direction of corresponding member of the Academy of Sciences USSR N. N. Vorozhtsov, G. K. Boreskov, V. V. Voyevodskiy, and doctor of chemical sciences M. F. Shostakovskiy. The scientists' efforts will be concentrated on discovering methods of synthesis of fluorine-containing aromatic monomers and obtaining the products of their polymerization for the purpose of synthesizing a series of polyfluoroderivations of styrene; their efforts will be concentrated on using a raw material for synthesis which contains an excessive amount (of coal tar compounds), and on the development of methods for preparing new silico-organic polymers with thermal stability that are resistant to oils and other products. The development of the scientific basis for selection and preparation of the catalysts for obtaining monomers and polymers should aid in improvement of the properties of catalysts used by industry at present (for the synthesis of acetaldehyde by single stage oxidization of ethylene, for the refinement of catalyst platforming for obtaining aromatic hydrocarbons from paraffin components of petroleum). The development of methods to regulate the composition of polymers during catalytic polymerization of olefins using solid catalysts will be undertaken simultaneously, as will the evolution of catalytic and chemisorptional methods of highly purifying monomers, solvents, and auxiliary compounds used for the synthesis of polymers (these methods may also be applied to refine technological gases, industrial waste gas and motor exhaust gas). Methods of dyeing artificial fibers and synthesis of dyes for synthetic materials will be studied, a fact which should lead to the development of recommendations for dyeing of caprone, "anid" / analine? /, and

lawsonia in bulk. To promote a better understanding of the question of the synthesis of high molecular compounds from monomers, the theory of chemical structure, kinetics and reaction capacity will be developed together with the Institute of Chemical Physics and other institutes of the department of chemical sciences of the Academy of Sciences USSR. As a result of the research the problems of changing the mechanical properties of polymers with exposure to light ("joining together" and destruction) will be studied, theoretical problems of isomerization of organic compounds for synthesis of certain monomers will be solved, ways of preparing catalysts with given properties will be shown, catalysts will be suggested for the synthesis of polymers, which themselves are complex metallo-organic compounds.

With regard to the chemistry of natural and biological compounds of importance special attention will be given to the problems of studying medicinal plants of Siberia and the Far East ("maraliy" ? root, ginseng, citron and others) and to the study of the chemical nature of their active principles. Methods of synthesis of biologically active compounds and physiologically active substances will also be developed (a series of homologs and substituted tryptophans); the study of the kinetics and mechanism of the formation of albumins - the most important components of live organisms - will be conducted, the development of new principles for obtaining compounds with cancer-healing action is expected simultaneously. At the head of these investigations are the corresponding members of the Academy of Sciences USSR N. N. Vorozhtsov and doctor of chemical sciences M. F. Shostakovskiy.

Corresponding members of the Academy of Sciences USSR A. V. Nikolayev, G. B. Boki, doctor of chemical sciences B. V. Ptitsyn and candidate of technical sciences T. V. Zabolotskiy direct the research on rare elements, metals and alloys with special properties for new technology.

The complex utilization of raw material going into plants of non-ferrous metallurgy, the improvement of present methods of extracting light metals, the development of plans for the joint processing of fluorite-beryllium and niobium-tantalum ores with the extraction of rare element compounds -- this is the list, not complete by far, of the tasks which

must be completed in the field of the natural raw material of Siberia and the Far East. The methods of extraction, high temperature redistillation and zone melting will be improved for the purpose of obtaining high purity compounds of rare-earth elements, silver and gold. The development of the crystallo-chemistry of inorganic substances, connected with the study of optical, semiconductor, magnetic and other properties, should aid in obtaining materials to meet the needs of modern technology.

In the field of radio-chemistry, under the direction of corresponding member of the Academy of Sciences USSR A. V. Nikolayev and G. K. Boreskov, the study of a wide complex of chemical and physico-chemical properties of uranium, plutonium and neptunium compounds will be conducted for the purpose of determining peaceful applications of atomic energy. The study of radiation chemistry should be widely developed to clarify the conditions of free radical formation during exposure processes, to formulate a scientific basis for the application of radiations for the synthesis of high energy chemical substances, to direct the course of chemical reactions, and so on.

Methods for calculating and modelling contact apparatus to formulate the scientific bases for the computation of catalytic plant installations according to the results of the model analyses without pilot plant experiments, (for instance for obtaining ethylene oxide) are being developed under the direction of corresponding member of the Academy of Sciences USSR G. K. Boreskov with the purpose of creating new processes and intensifying present technological processes in the chemical industry. Under the direction of doctor of chemical sciences V. T. Bykov and candidate of technical sciences A. T. Logvinenko the development of the physico-chemical bases for using the mineral raw material of Siberia and the Far East will be conducted, in order to formulate new methods of obtaining chemical products from salt, binding the construction materials from slime and clay, titanium concentrates and metallic titanium and magnesium from the minerals of eastern Siberia and methods of obtaining hydrofluoric acid, micro fertilizers and phosphorous fertilizers and sorbites from raw material from the Far East.

In the field of geologico-geographic sciences, large groups of scientists from the branch will study the laws of distribution of the most important useful minerals in the territory of Siberia and the Far East (petroleum, gas coal, ferrous and non-ferrous metals, rare and radioactive elements, diamonds), under the direction of academicians V. S. Sobolev, A. A. Trofimuk, A. L. Yanshin, corresponding members of the Academy of Sciences USSR Yu. A. Kosygin, Yu. A. Kuznetsov, V. A. Kuznetsov, B. S. Sokolov, E. E. Fotiada, F. N. Shakhov, G. A. Khel'kvist, doctors of geologico-mineral sciences V. P. Kazarinov, M. M. Odintsov, I. S. Rozhkov, Ye. A. Radkevich, V. G. Tkachuk and candidate of geologico-mineral sciences L. V. Tauson. The importance of these studies will rise considerably as the eastern regions of the USSR are drawn more intensively into the economy. Petroleum, gas, and also rich iron ores are of especial significance here.

Together with the departmental, scientific and production organizations and institutes of the Ministry of Geology and Conservation of Mineral Resources USSR and the higher educational institutions of Siberia and the Far East, the structure and development of the earth's crust in the platform and geological trough regions of Siberia and the Far East will be studied as a theoretical basis for the prospecting of useful minerals; these institutions will also study the laws of distribution of different types of useful minerals with the aim of determining the prospects and direction of exploitation. As a result of the study a theoretical basis of the laws of distribution of deposits of useful minerals will be formulated; a recommendation will be made as to the course to be taken in prospecting work; new types of maps will be presented as well as methods of compiling them.

The study of current endogenous and exogenous processes (dynamics of depressions, eternal freezing, underground waters, volcanism, earthquakes, etc.), of their effect on engineering installations and of the forecasting of these processes will be conducted under the direction of corresponding members of the Academy of Sciences USSR B. I. Piyp, V. N. Saks, V. B. Sochava, G. A. Khel'kvist, E. E. Fotiada and professors A. A. Treskov and V. P. Solonenko.

The study of the natural conditions of Siberia and the Far East, the characteristics of the distribution of resources and their economic evaluation will be conducted under the direction of corresponding member of the Academy of Sciences USSR V. B. Sochava and Prof. V. A. Krotov. This research should promote the drawing up of maps of natural conditions and resources and the establishment of large industrial bases to the East of the country.

Scientists are working on the formulation of new geological, geophysical and geochemical methods of prospecting for useful minerals under the direction of Academician A. A. Trofimuk, corresponding members of the Academy of Sciences USSR E. E. Fotiada, F. N. Shakhov, K. B. Karandeyev and candidate of geologico-mineral sciences L. V. Tauson.

In connection with the vigorous development of work on closed territories, the greatest attention is being given to the questions of improving the present methods and of evolving new methods of prospecting for useful minerals, using the latest achievements in the field of nuclear physics, ultrasonics, infra-red spectra and other physical phenomena. A detailed study is to be made of the composition of useful minerals, including foreign elements, to recommend methods for the complete use of the mineral raw material. Current geophysical methods will be improved and theoretical bases for new methods will be developed for geochronological analysis, interpretation of magnetic anomalies and seismographic exploration data, for electroprospecting and for investigations of the composition of ore fields.

In the field of biological sciences research will be carried out at all the locations of the institutes of the Siberian branch.

Doctor of biological sciences I. D. Romanov directs the study of physical, chemical and structural foundations of life phenomena and heredity. In this plan it is intended to analyze the role of nucleic acids in the transmission of hereditary information, in the synthesis of albumins of living cells and growing organisms, and to study the mechanism of mitosis, and to clarify the physical and chemical forces participating in this process.

Research on the effect of ionizing radiation on the

hereditary structure of man, mammals and the development of plants should be substantially developed. The biophysics of the blood cells will be specially investigated. It is intended to give a physico-chemical characteristic to the qualitative composition of erythrocytes and quantitative characteristic to the kinetics of hemolysis. It is intended to introduce into medical practice the biophysical method of blood analysis in different physiological and pathological conditions and also to develop the equipment to carry out these analyses.

Groups under the direction of candidate of biological sciences D. K. Belyayev and doctor of agricultural sciences V. B. Enken and doctor of biological sciences D. F. Petrov are dealing with the questions of controlling the heredity and productivity of plants, animals and micro organisms, of controlling the heterosis of domestically useful animals and plants, of increasing the activity of producers of antibiotics. It is intended to use methods of radiation selection and chemical mutation agents to obtain new forms of winter-crop wheat and other mutants. On the basis of the study of the phenomenon of heterosis it is planned to obtain hybrid corn for Siberia, triploid sugar beets and polyploids of essential oil crops, buckwheat and other crops. It is also planned to further develop the work on genetics and selection of animals and the use of heterosis in animal husbandry and in the ecological genetics of animals. The characteristics of the cytology of the cancer cell and the changes of the hereditary nature of micro organisms will be studied. A special place is reserved for the study of apomixis in corn and in a series of other crops, and to further improvement of the selectional-genetic study of I. V. Michurin.

Work on the regeneration and transplantation of tissue is being conducted under the direction of professor I. K. Yesipova. As a result of the complex approach to the given problem it is intended to develop new histological, histo-chemical, biochemical and immunological methods, with special attention given to the submicroscopic changes taking place during regeneration in cells and the intercell material. As a result it is expected to be possible to prevent thick sclerosis, and to arrive at a more perfected regeneration

of parenchymatous elements; data will be obtained on overcoming the incompatibility of organs and tissues upon their transferral from one organism to another.

Under the direction of doctor of medical sciences Ye. N. Meshalkin the regeneration and compensation processes in the cardio-vascular system during its major diseases and during surgical operations will be studied. On the basis of the study of blood circulation in man new methods of diagnosis, treatment and surgical intervention in diseases of the cardio-vascular system will be formulated. Under the direction of candidate of medical sciences V. N. Nikiforov the regional pathology of Siberia is being developed, with special study of virus infections and rickettsia, as a result of which measures for fighting infectious diseases will be recommended. It is also intended to develop the research on radiational pathology with the purpose of formulating preventive measures and the treatment of radiation disease in man.

The scientific bases for the rational use of Siberia's soil in the regions to be worked first (Bratsko-Tayshetskiy water power installation, Irkutskaya Oblast Barabinskaya forest-steppe) are being worked out by groups of scientists under the direction of doctor of agricultural sciences R. V. Kovalev and Prof. V. G. Zol'nikov. The large complex of work will permit the closer study of the questions of classification, geography and genesis of soils, the study of erosion processes, of the microflora and micro elements of soil, its water, temperature and saline processes. On the basis of the research a partial definition of the earth reserves will be worked out and soil maps of a series of geographical regions of Siberia and the Far East will be set up.

The study of the flora and vegetation of Siberia and the Far East, their geographical distribution, concentration, transformation and analysis is being conducted under the direction of doctors of biological sciences K. A. Sobolevskaya, T. G. Popova and doctor of agricultural sciences, A. B. Zhukov, with the purpose of increasing the productivity of the forests, of establishing a stable fodder base and obtaining new pharmaceutical technical raw material. We must obtain important material concerning the character-

istic vegetation cover of fodder lands and forest areas, concerning the increase of productivity and the reduction of the restoration period of forests. We must obtain means of fundamental improvement of swamps and salt water marshes, develop methods of planting trees and gardens in the towns of Siberia; we must find types and sorts of vegetables, grain and fruit-berry plants, which are new to Siberia, set up geobotanical maps for part of the Yakutskaya ASSR and the Far East. On the basis of special studies means will be recommended for the propagation and methods of using wild plants in the national economy.

The study of the physiological bases of the resistivity of plants, and of the means of increasing it to enlarge the productivity of agricultural crops of Siberia and the Far East is being carried out under the direction of doctor of biological sciences F. E. Reymers, candidates of biological sciences V. F. Al'tergot, and I. F. Belikov. It is intended to develop methods of active reaction on the crops, methods of increasing the plants' resistance to cold, heat and winter, to develop methods of increasing the yield of potatoes in Yakutiya, recommendations for the cultivation of vegetables in the severe conditions of the Tayshet region, to propose new types of plants as raw material for the pharmaceutical industry, to study the characteristics of plants' assimilation of different forms of fertilizers on the soils of the southern part of Sakhalin.

The research on the fauna of Siberia and the Far East under the direction of doctors of biological sciences A. I. Cherepanov, A. I. Kurentsov, S. U. Stroganov suggests the study of fauna in systematic categories, the study of the biology of species especially important in the practical sense (fur-seal, kalan, sable, mink), the study of the questions of ichthyology, of the biology of industrial animals and of agricultural entomology. As a result of this, recommendations will be worked out for the control of pests in forestry and agriculture (Siberian silkworm, water rat), recommendations will be given for trapping, the scientific bases for fishing in Yakut' and in Sakhalin will be determined, suggestions for the rational use of fur resources in Sakhalinskaya Oblast will be prepared.

The development of the methods of fighting filth in

Siberia, conducted by the commission under the direction of Professor V. I. Poltev is of great importance for the increase of man's labor output in a period of mass dissemination of blood sucking insects. It is intended to work out effective methods of controlling gnats by means of scaring away, enticement, and destruction of blood-sucking diptera and others.

In the field of economical sciences, under the direction of corresponding member of the Academy of Sciences USSR G. A. Prudenskiy the reserves for the growth of the labor output and the rational use of labor resources in the branches of heavy industry of Siberia and the Far East are being studied. In connection with the planned increase, the labor output in these regions is 1.5 to two times greater than the average in the USSR; this problem is of special significance currently. By developing the methodology, compilation of the current and prospective balance of labor resources in the territorial cross section and in the leading branches of industry (metallurgical, heavy machinery, chemical, mining and timber) it is expected to obtain a prospective (up to 1972) plan of using labor resources as a scientific basis for the prospective plan of developing the national economy for the following period. The new methods of analysis of working time being developed by the Institute of Economics will be of importance in the study of the resources for the increase of labor output. The study of the leisure time of workers undertaken by the economists of Siberia will have a great scientific and practical meaning. Already in 1959 budgets of workers' time have begun to be worked out in a series of towns.

All these studies are conducted in close cooperation with the Councils of National Economy and with the economics departments of institutes of higher learning in the eastern regions of the country.

Scientists of the branch led by corresponding member of the Academy of Sciences USSR N. N. Nekrasov are dealing with the technico-economical evaluation of natural resources and the rational distribution of productive forces in Siberia and the Far East. These studies should ensure the right distribution of the main centers of development of heavy industry corresponding to the concentrations of natural resources and should give a scientific foundation to the

large scale complex industrial bases planned. This will permit a scientific basis for evaluation of natural resources of Siberia and the Far East, and their significance for our country.

Under the direction of Prof. V. Ye. Yevreyskov the scientific basis of the development of a transport network for Siberia is being worked out, in view of the evaluation of the development in western Siberia and the Krasnoyarskiy Kray all types of transport are being foreseen: rail, water, motor, air, and pipeline. Recommendations are expected to be given to the planning organizations concerning the development of the transport network in the given region for the years from 1975 to 1980, concerning the consideration of the rational transportation of ore, coal and timber in connection with the establishment of a third metallurgical base, concerning the projected methods for shielding large objects from snow drifts and shielding roads from snow slides, etc. The work is being conducted in coordination with the Institute of Complex Transportation Problems and other institutes of the Academy of Sciences USSR.

In the field of humanitarian sciences the Permanent Commission of the Siberian Branch of the Academy of Sciences USSR on general sciences, under the direction of doctor of philosophical sciences I. I. Matveyenkov will direct its work toward the further development of the theory and practice of communist education in the extensive development of communism in the USSR.

In conjunction with the departments of philosophy of higher educational institutions in Siberia and the Far East a study will be begun of the creative activity of large groups in plants, kolkhozes and educational institutions. Particular attention will be paid to such questions as the role of labor in a communist education, the role of the team of communistic labor in obliterating the differences between physical and mental labor, moral intelligence as a higher form of personal interest, etc. Great attention will be paid to questions of communistic morals, problems of scientific-atheistic and esthetic education of workers which are an integral part of the formation of a communistic world view.

A permanent commission will coordinate the work of

the departments of history of higher educational institutions in Siberia and the Far East in order to write a fundamental work "History of the Socialist and communist construction in Siberia and the Far East," will prepare a series of works on the history of Yakutiya and the Kuzbass, on the history of party organizations of Novosibirskaya, Kemerovskaya and Irkutskaya Oblasts and the Krasnoyarskiy Kray and other works.

A great deal of coordinating work is in prospect for the Permanent Commission in the areas of the literature and the art of socialistic realism and their role in communist education, and also on problems of Russian linguistics, studies of the national languages and dialects of the peoples of Siberia and the Far East.

The enumerated areas of work will unite the efforts of not only the scientists of the Siberian branch. For many problems, scientific councils have been created which unite representatives of the Siberian branch, enterprises and councils of the national economy of Siberia and the Far East, workers in higher educational institutions and branches of the scientific research institutes of Novosibirsk, Krasnoyarsk and other cities.

So as to register the interests of different oblasts and regions of Siberia and the Far East the plans of research are sent to all Councils of National Economy of these economical regions, the wishes of the interested organizations are taken into consideration and proposed for realization in the plans of the institutes of the branch. An analogous coordination is taking place through the Presidium of the Academy of Sciences USSR with the branches of the Academy of Sciences in specialized fields, unfortunately this is one sided: the plans of the Siberian branch are considered by the branches of the Academy of Sciences USSR, and the Siberian branch is not informed of the plans of other branches. There are all reasons to think that in the future a closer mutual interchange will take place. This will permit the avoidance of possible parallelism in research and really concentrated efforts and means for solving the most important problems which have been presented to us through the decisions of the 21st Congress of the Communist Party of the Soviet Union.

To bring to realization the recommendations made by

scientific committees concerning those problems, the Siberian branch has begun publishing works dedicated to current questions. Consequently a collection of reports was published in March from the conference held on the problem of explosions in February 1959, under the direction of academician M. A. Lavrent'yev. The rapid informing of the newest achievements of science and technology should serve toward the more rapid application of the achievements of science to the national economy.

The scientists of the Siberian branch are carrying out on a large scale an experimental introduction into industry of completed scientific-research work. If in 1959 41 works were altogether completed in this section, in 1960 the experimental-industrial introduction of more than 60 works will take place in the field of technical, chemical and biological sciences.

For example the Institutes of Automation and Electrometry presented the development of the complex of aero-electro-prospecting equipment with an endless cable, permitting the study of the possibility of deposits of useful minerals in inaccessible parts of the country with the use of a drill, which considerably shortens the time of the planned electro-prospecting works. The Institute of Radio-Physics and Electronics is introducing a new instrument "Tiraliftron" which is important for the use of the ionic power transformer; it is also introducing a wide band amplifier with a continuous wave type tube. The Institute of Mining is introducing a number of works: a shield system for the hydraulic cutting of coal; a tent shield on rollers for seams on a slanted grade; a combined chamber-shield prospecting system: self-propelled machine BM-150; a drilling semi-automatic machine NKR-100 for the drilling of deep holes in solid ores underground; equipment for a high frequency control room network and tele-signalling in ore mining pits and in the town electrical transport "Sibir-59." The Transport-Power Institute is introducing new snow retention devices, a furnace with a mechanical grill flail BTsR-M on river vessels and other works. The Yakutsk Affiliate has presented works for introduction for the enriching of small classes of diamond concentrates. The Sakhalinskiy complex NII plan for the improvement of concentration plants in Sakhalin has cut

the losses of coal fines in tailings, on account of which a savings of about 1 million rubles was made during one year in only three pits of the "Sakhalinygol'" combine.

The Chemico-Metallurgical Institute is introducing a number of works into industry, the most important of which is the technology of coking gaseous coal with a preliminary thermal treatment in the "boiling layer." The East Siberia Affiliate is organizing the production of acrolein by the catalytic oxidization of propylene, a test under experimental plant conditions of the technology of granulating sillimanite and kaolin mixtures for the melting of silicon-aluminum alloys and a series of other works. The Far East Affiliate is analyzing methods of obtaining phosphorous fertilizers using local raw material. The Sakhalin Complex NII is preparing local binding materials from mineral raw material from the southern part of Sakhalin and is introducing other works concerning chemistry.

The Institute of Biology is introducing new methods of controlling the water rat, which is the pest of agricultural cultivation and the spreader of rabbit fever; the complex application on crops of spring wheat of additional fertilizers, not of the root kind, and substances for chemical destruction of weeds (herbicides) to permit the increase of the harvest of grain to two centners per hectare, and they are doing other work. The Central Siberian botanical garden is introducing new forms of fruit-berry and medicinal plants and agricultural crops. The Far-Eastern Affiliate and the Sakhalin KNII are doing research in the field of biology.

In the future the scientific institutes of the Siberian Branch of the Academy of Sciences USSR will considerably increase their working links with the industrial and agricultural enterprises of Siberia and the Far-East.

At present the scientists of the Siberian branch are working on the great task of setting up the general plan of the development of the national economy for the years from 1960 to 1975 and for the development of all branches of science during this period. Specialists in all fields of science, in cooperation with Party, Soviet and industrial organizations of the Siberian and Far Eastern oblasts, krais, autonomous republics and national okrugs, are preparing for the Academy of Sciences USSR and for the Soviet Government

a proposal for the development of industrial strength in Siberia and the Far East, for the distribution of centers of coal, metallurgical, chemical and other branches of industry, regions for reclaiming lands for agriculture and for moving north of the cultivated area. Questions are being formulated for the development of scientific research for a period of 15 years in the field of physico-mathematical, technical, chemical, geologico-geographic, biological, economical and other general sciences.

In the future such questions will be decided as for the example the creating of a completely automatic pit, working without people, for which it is necessary to combine the efforts of miners, physicists, mathematicians, electromechanic specialists, automation and telemechanics specialists; the development of means of using the ultra-high pressure (up to 100,000 atmospheres) and temperatures up to 10,000° promises many innovations for the chemical industry, and so on.

The rapid growth of the number and quality of scientific research operations in Siberia and the Far East is unimaginable without the development of new institutes and scientific centers, and their further expansion towards the East. For the new scientific institutes it is necessary to have a sufficient number of scientific teams, For this reason, the geographic position of new points of development of sciences will be shown in the proposal, as well as the places of the organization of new scientific centers and higher learning institutes in Siberia and the Far East.

Exceptional attention and help is being given to the Siberian branch of the Academy of Sciences USSR by the Soviet Government and the Central Committee of the Communist Party of the Soviet Union. A prominent event in the history of the Siberian branch was the visit to Nauchniy gorod in Novosibirsk by N. S. Khrushchev, his talk with the leading scientists and the advice given to them and remarks made as to the development of scientific research.

The widening of the network of scientific institutes, the strengthening of the link between scientists and industry, the quicker introduction of the results of scientific research into the national economy and the culture of the

country -- in this lies the guarantee of the successful development of science in the East of the USSR -- our contribution to the great task of building communism. The scientists of the Siberian branch fully justify the confidence the Communist Party and the Soviet Government has in them.

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